WHAT IS CLAIMED IS:

1. A method for reducing impurities in cellulose fibers for manufacture of fiber reinforced cement composite materials, comprising:

processing the fibers in an aqueous solution for a predetermined retention time, wherein the solution temperature is greater than about 65°C; and

providing agitation to the solution so as to facilitate diffusion of impurities from the pores and lumens of the fibers.

2. The method of Claim 1, wherein processing the fibers in the aqueous solution comprises soaking and washing the fibers counter-currently.

3. The method Claim 1, wherein the solution temperature is between about 65°C and 120°C.

4. The method of Claim 1, wherein the retention time is between about 1 to 36 hours.

5. The method of Claim 2, wherein processing the fibers comprises soaking the fibers in a series of washing systems.

6. The method of Claim 5, wherein processing the fibers comprises soaking the fibers for about 30 minutes to 2 hours in each of the series of washing systems.

7. The method of Claim 5, wherein processing the fibers comprises soaking the fibers in up to six reactors.

8. The method of Claim 7, wherein the reactors are bleaching towers.

9. The method of Claim 5, wherein processing the fibers comprises soaking the fibers in a series of continuous plug flow bleaching reactors.

10. The method of Claim 5, wherein processing the fibers comprises soaking the fibers in a bleaching reactor followed by soaking the fibers in a bleached stock washer.

11. The method of Claim 1, wherein processing the fibers comprises processing the fibers in washing systems selected from the group consisting of washers, storage tanks, reactors, mixers, agitators, pumps, centrifuges, and filter presses.

12. The method of Claim 1, wherein processing the fibers comprises processing the fibers in washing systems selected from the group consisting of bleaching reactors,

bleached stock washers, pulp transportation pumps, pulp dispersion/diffusion screw feeders, stock mixers and agitators, bleached stock storage towers, and bleached stock deckers.

13. The method of Claim 1, wherein the impurities comprise COD compounds.

14. The method of Claim 13, wherein processing the fibers comprises introducing at least one chemical to the solution, wherein the chemical reacts with the COD compounds and causes the compounds to become more soluble in the aqueous solution.

15. The method of Claim 14, wherein the chemicals are selected from the group consisting of chemicals comprising oxygen, ozone, and hydrogen peroxide, and mixtures thereof.

16. The method of Claim 1, wherein processing the fibers comprises maintaining the fibers at a pulp consistency of about 1% to 35% in the aqueous solution.

17. The method of Claim 1, further comprising washing the fibers in a brown stock washer system prior to processing the fibers.

18. The method of Claim 17, wherein washing the fibers in a brown stock washer system comprises washing the fibers at a temperature greater than about 65°C.

19. The method of Claim 18, wherein washing the fibers in the brown stock washer system removes a large portion of the impurities from the fibers.

20. A pulping process, comprising:

providing a delignified fiber substance;

converting the delignified fiber substance into fiber pulps;

washing the pulps at elevated temperatures greater than about 65°C in a manner so as to remove a large portion of COD components from the pulps; and

processing the pulps in additional washing cycles so as to remove substantially all remaining COD impurities.

21. The pulping process of Claim 20, wherein processing the pulps in additional washing cycles comprises soaking the pulps in counter-current water at elevated temperatures greater than about 65°C for a predetermined retention time.

22. The pulping process of Claim 20, wherein providing a delignified fiber substance comprises delignifying a fiber substance selected from the group consisting of softwood, hardwood, agricultural raw materials, and lignocellulosic raw material.

23. The pulping process of Claim 20, wherein processing the pulps in additional washing cycles comprises adding a chemical that reacts with COD compounds in the pulps and causes these compounds to become more soluble in aqueous solutions.

24. A low COD cellulose fiber comprising a COD content of less than about 5kg/ton of oven dried pulp.

25. A composite building material incorporating reinforcing fibers, wherein at least a portion of the fibers have a COD content less than about 5 kg/ton.

26. The composite building material of Claim 25, further comprising a cementitious matrix.

27. The composite building material of Claim 26, wherein the cementitious matrix incorporating the individualized cellulose fibers is autoclaved.

28. The composite building material of Claim 25, wherein the reinforcing fibers are cellulose fibers made from cellulose pulps of lignocellulosic materials by a pulping process.

29. The composite building material of Claim 25, further comprising an aggregate.

30. The composite building material of Claim 29, wherein the aggregate is ground silica.

31. The composite building material of Claim 25, further comprising one or more density modifiers.

32. The composite building material of Claim 25, further comprising one or more additives.

33. A material formulation used to form a composite building material, comprising:

a cementitious binder;

an aggregate;

one or more density modifiers;

one or more additives; and

cellulose fibers, wherein at least a portion of the fibers comprise low COD fibers, wherein the low COD fibers have a COD content of less than about 5 kg/ton of oven dried pulp.

34. The formulation of Claim 33, wherein the cementitious binder is selected from the group consisting of Portland cement, high alumina cement, lime, high phosphate cement, and ground granulated blast furnace slag cement, and mixtures thereof.

35. The formulation of Claim 33, wherein the aggregate is selected from the group consisting of ground silica, amorphous silica, micro silica, diatomaceous earth, coal combustion fly and bottom ashes, rice hull ash, blast furnace slag, granulated slag, steel slag, mineral oxides, mineral hydroxides, clays, magnasite or dolomite, metal oxides and hydroxides, and polymeric beads, and mixtures thereof.

36. The formulation of Claim 33, wherein the density modifier is selected from the group consisting of plastic materials, expanded polystyrene, glass and ceramic materials, calcium silicate hydrates, microspheres and volcano ashes including perlite, pumice, shirasu basalt, and zeolites in expanded forms, and mixtures thereof.

37. The formulation of Claim 33, further comprising additional fibers selected from the group consisting of natural inorganic fibers, synthetic polymer fibers, regular cellulose fibers and mixtures thereof.

38. The formulation of Claim 33, wherein the low COD fibers are fibrillated to the freeness of about 150 to 750 degrees of Canadian Standard Freeness.

39. The formulation of Claim 33, wherein the low COD fibers comprise about 2%-20% of the formulation by weight.

40. The formulation of Claim 33, comprising about 10%-80% cement by weight.

41. The formulation of Claim 33, comprising about 20%-80% silica by weight.

42. The formulation of Claim 33, comprising about 0%-50% lightweight density modifiers by weight.

43. The formulation of Claim 33, comprising about 0%-10% additives by weight.

44. The formulation of Claim 33, wherein the low COD fibers improve the modulus of rupture of the fiber cement composite material by more than about 10%,

compared to a fiber cement composite material made with an equivalent formulation containing fibers with COD content greater than about 5 kg/ton.

45. The formulation of Claim 33, wherein the low COD fibers improve the modulus of elasticity of the fiber cement composite material by more than about 10%, compared to a fiber cement composite material made with an equivalent formulation containing fibers with COD content greater than about 5 kg/ton.

46. The formulation of Claim 33, wherein the low COD fibers improve the ultimate strain of the fiber cement composite material by more than about 10%, compared to a fiber cement composite material made with an equivalent formulation containing fibers with COD content greater than about 5 kg/ton.

47. The formulation of Claim 33, wherein the low COD fibers reduce the amount of COD released to process water by more than about 10% in the manufacture of the fiber cement composite material, compared to a fiber cement composite material made with an equivalent formulation containing fibers with COD content greater than about 5 kg/ton.

48. The formulation of Claim 33, wherein the low COD fibers improve the toughness physical and mechanical properties of the fiber cement composite material, compared to a fiber cement composite material made with an equivalent formulation containing a fiber with COD content greater than about 5 kg/ton.

49. A method of manufacturing a fiber reinforced cement composite material using low COD fibers, comprising:

preparing fibers to have a low impurity content;

mixing the low impurity fiber with a cementitious binder and other ingredients to form a fiber cement mixture;

forming the fiber cement mixture into a fiber cement article of a pre-selected shape and size; and

curing the fiber cement article so as to form the fiber reinforced composite building material.

50. The method of Claim 49, wherein the fibers are individualized cellulose fibers.

51. The method of Claim 49, wherein preparing low impurity fibers comprises washing the fibers counter-currently above about 65°C in a solution.

52. The method of Claim 49, wherein preparing low impurity fibers further comprises adding a chemical to the washing solution, wherein the chemical reacts with COD components in the fiber and causes the COD components to be more soluble in aqueous solutions.

53. The method of Claim 49, wherein the fibers have a COD content of less than 5 kg/ton of oven dried pulp.

54. The method of Claim 49, further comprising dispersing the fibers at a pre-selected consistency and fibrillating the fibers to a pre-selected freeness range.

55. The method of Claim 49, further comprising dispersing the fibers comprises dispersing the fibers at a consistency of 1% to 6%.

56. The method of Claim 49, further comprising fibrillating the low COD fibers to the freeness of 150 to 750 degrees of Canadian Standard Freeness.

57. The method of Claim 56, wherein fibrillating the fibers comprises using equipment selected from the group consisting of hydra pulpers, refiners, hammer-mills, ball-mills, and deflakers.

58. The method of Claim 49, further comprising mixing the fibers with an aggregate, a density modifier and additives.

59. The method of Claim 49, wherein forming the fiber cement article comprises forming the article using a process selected from the group consisting of a Hatschek sheet process, a Mazza pipe process, a Magnani process, injection molding, extrusion, hand lay-up, molding, casting, filter pressing, Fourdrinier forming, multi-wire forming, gap blade forming, gap roll/blade forming, Bel-Roll forming, and combinations thereof.

60. The method of Claim 49, wherein forming the fiber cement article further comprises pressing, embossing the formed fiber cement article, and other post forming processes.

61. The method of Claim 49, wherein curing the fiber cement article comprises pre-curing and curing.

62. The method of Claim 61, wherein the fiber cement article is pre-cured for up to 80 hours at ambient temperature.

63. The method of Claim 61, wherein the fiber cement article is pre-cured for up to 24 hours at ambient temperature.

64. The method of Claim 61, wherein the fiber cement article is cured in an autoclave.

65. The method of Claim 64, wherein the fiber cement article is autoclaved at an elevated temperature and pressure at about 60 to 200°C for about 3 to 30 hours.

66. The method of Claim 64, wherein the fiber cement article is autoclaved at an elevated temperature and pressure at about 60 to 200°C for about 24 hours or less.

67. The method of Claim 64, wherein curing the fiber cement article comprises air curing for up to 30 days.